



- (51) International Patent Classification:  
G02B 6/036 (2006.01)
- (21) International Application Number:  
PCT/US2012/069470
- (22) International Filing Date:  
13 December 2012 (13.12.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
61/569,939 13 December 2011 (13.12.2011) US
- (71) Applicant: OFS FITELE, LLC [US/US]; 2000 Northeast Expressway, Norcross, GA 30071 (US).
- (72) Inventor: ZHU, Benyuan; 76 Harvard Circle, Princeton, NJ 08540 (US).
- (74) Agents: MORRA, Michael, A. et al.; OFS Fitel, LLC, 2000 Northeast Expressway, Norcross, GA 30071 (US).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,

DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

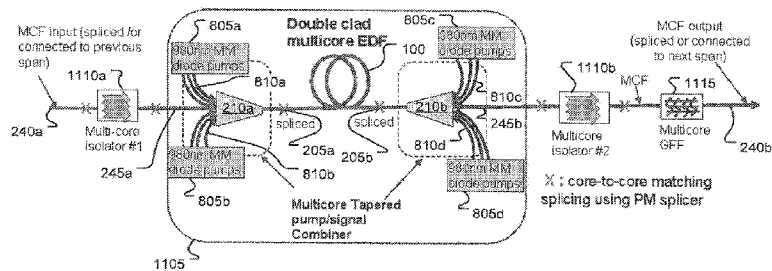
- (88) Date of publication of the international search report:  
4 December 2014



WO 2013/090549 A3

(54) Title: MULTI-CORE ERBIUM-DOPED FIBER AMPLIFIER

FIG. 10



(57) Abstract: A double-clad (DC) multicore (MC) Erbium-doped fiber amplifier (EDFA) for dense-wavelength-division multiplexing (DWDM) is disclosed. The DC-MC-EDFA comprises a length of DC-MC Erbium-doped fiber (EDF) that is core-matched spliced to a MC tapered signal-pump fiber combiner (TFC). For some embodiments, the optical signals are coupled into the DC-MC-EDF by the MC-TFC, and the pump energy is also coupled into the DC-MC-EDF by the MC-TFC. For some embodiments, the optical signals are also transmitted out of the DC-MC-EDF through the MC-TFC.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/069470

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - G02B 6/036 (2013.01) USPC - 385/43 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8) - G02B 6/00, 02, 036, 24, 255, 36, 38 (2013.01) USPC - 359/341.1, 341.3, 341.5; 385/39, 43, 95, 123, 126, 127 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - G02B 6/00, 02, 02042, 036, 03616, 24, 255, 36, 38, 3801 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatBase, Google Patents, Google Scholar		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/0279888 A1 (FINI et al) 17 November 2011 (17.11.2011) entire document	2, 3, 5-8, 10, 13, 15, 17, 21
---		-----
Y	US 2010/0278486 A1 (HOLLAND et al) 04 November 2010 (04.11.2010) entire document	1, 4, 9, 11, 12, 14, 16, 18-20
---		-----
Y	US 6,381,063 B1 (LIU) 30 April 2002 (30.04.2002) entire document	4, 9
---		-----
A	US 2010/0021118 A1 (CHEN et al) 28 January 2010 (28.01.2010) entire document	1
---		-----
Y	US 5,474,588 A (TANAKA et al) 12 December 1995 (12.12.1995) entire document	11
---		-----
Y	US 5,497,442 A (ROOS et al) 05 March 1996 (05.03.1996) entire document	12
---		-----
A	US 2008/0018989 A1 (TANIGAWA et al) 24 January 2008 (24.01.2008) entire document	1
---		-----
Y	US 5,497,442 A (ROOS et al) 05 March 1996 (05.03.1996) entire document	14
---		-----
Y	US 5,497,442 A (ROOS et al) 05 March 1996 (05.03.1996) entire document	16
---		-----
A	US 2008/0018989 A1 (TANIGAWA et al) 24 January 2008 (24.01.2008) entire document	1
---		-----
Y	US 2008/0018989 A1 (TANIGAWA et al) 24 January 2008 (24.01.2008) entire document	1, 18-20
---		-----
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 04 February 2013		Date of mailing of the international search report <b>20 FEB 2013</b>
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774